

CLAIMS

1. An automotive occupant position restraint apparatus for sensing a position of an occupant of a motor vehicle, said apparatus comprising:
 - an optical energy source configured to emit a first beam of optical energy;
 - a diffractive element disposed in a path of the first beam of optical energy, said diffractive element being configured to expand the first beam of optical energy into a plurality of second beams of optical energy spanning across a first angle;
 - a lens arrangement disposed in a path of the second beams of optical energy, said lens arrangement being configured to expand the second beams of optical energy into a plurality of third beams of optical energy spanning across a second angle larger than the first angle; and
 - an optical energy receiver configured to receive optical energy from the third beams, wherein the received optical energy has been reflected within a passenger compartment of the motor vehicle.
2. The apparatus of claim 1, wherein said optical energy source comprises a laser configured to emit a first beam of near infrared light.
3. The apparatus of claim 1, wherein said diffractive element comprises a diffraction grating.
4. The apparatus of claim 1, wherein the second beams span across a third angle oriented perpendicular to the first angle.
5. The apparatus of claim 4, wherein the third beams span across a fourth angle oriented perpendicular to the second angle.

6. The apparatus of claim 1, wherein the second angle is approximately between 90° and 150°.

7. An automotive occupant position restraint apparatus for sensing a position of an occupant of a motor vehicle, said apparatus comprising:
an optical energy source configured to emit a first beam of optical energy;

a beam splitting device disposed in a path of the first beam of optical energy, said beam splitting device being configured to expand the first beam of optical energy into two second beams of optical energy spanning across a first angle;

at least one diffractive element, said at least one diffractive element being disposed in paths of the second beams of optical energy, said at least one diffractive element being configured to expand each of the second beams of optical energy into a plurality of third beams of optical energy such that the third beams from said at least one diffractive element conjunctively span across a second angle larger than the first angle; and

an optical energy receiver configured to receive optical energy from the third beams, wherein the received optical energy has been reflected within a passenger compartment of the motor vehicle.

8. The apparatus of claim 7, wherein said beam splitting device comprises a first diffraction grating, and said at least one diffractive element comprises a second diffraction grating.

9. The apparatus of claim 7, wherein said beam splitting device comprises a pair of equilateral triangle prisms having a beam split coating disposed therebetween.

10. The apparatus of claim 7, wherein the third beams span across a third angle oriented perpendicular to the second angle.

11. The apparatus of claim 7, wherein said at least one diffractive element comprises a pair of diffraction gratings attached to said beam splitting device.

12. The apparatus of claim 7, wherein the second angle is approximately between 90° and 150°.

13. An automotive occupant position restraint apparatus for sensing a position of an occupant of a motor vehicle, said apparatus comprising:
an optical energy source configured to emit a first beam of optical energy;

a first optical arrangement disposed in a path of the first beam of optical energy, said first optical arrangement being configured to expand the first beam of optical energy into a plurality of second beams of optical energy spanning across a first angle;

a second optical arrangement disposed in a path of the second beams of optical energy, said second optical arrangement being configured to expand the second beams of optical energy into a plurality of third beams of optical energy spanning across a second angle larger than the first angle; and

an optical energy receiver configured to receive optical energy from the third beams, wherein the received optical energy has been reflected within a passenger compartment of the motor vehicle.

14. The apparatus of claim 13, wherein said optical energy source comprises a laser configured to emit a first beam of near infrared light.

15. The apparatus of claim 13, wherein said second optical arrangement comprises a lens arrangement.

16. The apparatus of claim 13, wherein the second beams span across a third angle oriented perpendicular to the first angle.

17. The apparatus of claim 16, wherein the third beams span across a fourth angle oriented perpendicular to the second angle.

18. The apparatus of claim 13, wherein the second angle is approximately between 90° and 150° .

19. The apparatus of claim 13, wherein said first optical arrangement comprises a beam splitter.

20. The apparatus of claim 13, wherein the first angle is coplanar with the second angle.